

# BIOENGINEERING & BIOMEDICAL ENGINEERING RESEARCH SEMINAR

## MECHANISMS OF PEDIATRIC BRAIN TUMORS PROGRESSION AND OPPORTUNITIES FOR LONGITUDINAL MONITORING USING LIQUID BIOPSY APPROACHES



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Brain tumors are the most common solid tumors in children, and they represent the second most common type of childhood cancer after leukemia. They can occur at any age during childhood, from infancy to adolescence. There are several different types of pediatric brain tumors, and they can be classified based on their location, appearance under the microscope, and genetic characteristics. Common types include medulloblastoma, glioma, ependymoma, and brainstem glioma. Ongoing research is focused on understanding the genetic and molecular characteristics of pediatric brain tumors, which has led to the development of more targeted and personalized treatment approaches. In medulloblastoma, recent research advances have shown that this disease is genetically and molecularly diverse, and researchers have identified various mutations and copy-number changes in the genome associated with different subtypes of medulloblastoma.

Most of the medulloblastoma patients succumb to metastatic spreading of tumor cells to the leptomeninges, a condition that is currently untreatable. We discovered a previously unrecognized route of dissemination of medulloblastoma through the bloodstream, and exploited this hematogenous dissemination route to create models of leptomeningeal metastasis suitable for molecular profiling. Medulloblastoma metastases are substantially different from matching primary tumors, and have an increased secretory activity. The blood proteome of medulloblastoma patients carries circulating tumor cells and proteins that can be exploited as biomarkers for non-invasive disease monitoring in the context of early detection of primary disease as well as monitoring of MRD and progression on therapy. Ultimately, early detection of primary or metastatic disease may offer a window of opportunity to improve the outcome of children with medulloblastoma.

Dr. Garzia is a medical biotechnologist by training, she earned a PhD in life science from a joint program between the University of Naples (Italy) and the Open University, Cambridge (UK). She discovered non-coding RNAs involved in brain embryonal development that when ectopically expressed or unduly silenced contributed to brain tumor pathogenesis. Dr Garzia then moved to Toronto in the lab of Dr. Michael Taylor as post-doctoral fellow, where she focused on a malignant brain tumor of children called medulloblastoma. Dr. Garzia work on the mechanisms of cancer relapse and metastasis led to seminal discoveries that have changed the approach to recurrent disease in the context of clinical trials for medulloblastoma. In 2017 she joined the Department of Surgery as an assistant professor, she holds the Nicole et Francois Angers Sarcoma Research Chair and is principal investigator at the Research Institute of the McGill University Health Centre. Her lab uses functional genomics approaches to identify genetic drivers of metastasis and resistance to therapy in pediatric cancers with a focus on the two biggest killers in the pediatric population, sarcomas and brain tumors.

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